



PERSONNEL  
QUALIFICATION STANDARD  
FOR  
GYROCOMPASS MK-27 - MOD-0

his place in the ship,  
his responsibilities to his shipmates  
and his purpose in fighting."

## INTRODUCTION

This publication has been written with one guiding receipt in mind; that "every sailor wants to do a good job and will perform that job well, if he is (1) sufficiently motivated, (2) properly instructed as to the scope and content of his duties and, (3) has the depth of knowledge he needs to fulfill his responsibilities." This Qualification Standard will assist you by providing a systematic approach to studying the material that is essential to your becoming a more productive member of the combat-ready qualified Navy team."

A brief explanation of the features of the Qualification Standard will help you understand how to use it.

First, do not let yourself become concerned with the physical thickness of the booklet and the quantity of words on each page. A broad but detailed knowledge of any subject is composed of many short answers to many types of questions. It takes a lot of words to ask these simply answered questions in a concise manner.

The format of the Qualification Standard and its numbering system forms a definite educational pattern. However, this pattern DOES NOT LIMIT either the instructor or the student to any sequence, method or technique of instruction.

The Qualification Standard has the following four main subdivisions:

- 100 Series - THEORY
- 200 Series - SYSTEMS
- 300 Series - WATCHSTATIONS
- 400 Series - QUALIFICATION CARDS

### 100 Series - THEORY

This section of the Qualification Standard specifies the theory background that will be required as prerequisites to the commencement of study in the specific equipment(s) for which this booklet is written. Normally, you would have acquired these fundamentals during the school phase of your training. If you have not been to school, the requirements are outlined and referenced to aid you in a self-study program.

In this portion, the equipment you are studying is broken down into functional sections. These functional sections can be studied and your achievement tested either orally or in writing in a reasonable amount of time. Words such as subassembly, drawer, unit, cabinet, etc., have been deliberately avoided because they more specifically refer to construction features deemed necessary by the manufacturer. "Physical boundaries" are more often distinctly different from the "functional boundaries"; for example, a system may have a lever, valve, switch, or antenna functionally connected to it but physically located in a different space. For a complete understanding, all functional parts must be considered in the study of the system.

In the 200 series there is a pattern to the numbers to the right of the decimal point as follows:

- .1 At this point you will always be asked to explain the function of the system.
- .11 Here you will be asked to draw a simplified version of the system from memory and/or
- .12 Refer to a standard print.  
(You will be asked to use either the simplified version or the standard print as a reference while studying the system.)

.2 SYSTEM COMPONENTS - GENERAL

The system's components are listed in this section and you will be told what you must learn about each component. Please note the definition of "component" is not restricted to a single piece of hardware with a single federal stock number. It may be either a single resistor or an entire pump assembly. Note also that component .29 is followed by component .210 vice .30. This is done to indicate the tenth item in the .2 list, etc.

.3 COMPONENT PARTS

This section breaks down the components into their component parts. Only those component parts essential to understanding are listed. Others, such as mounting bolts, brackets, and chassis are not included.

.4 PRINCIPLES OF OPERATION

Up to this point, the system has been considered from a purely "static" point of view. (What the system does.) In this section you will be called upon to evaluate the "dynamic" characteristics of the system: (how the components and component parts work together to perform the function of the system).

.5 MAJOR PARAMETERS

Obviously, all the numerical values in any given system need not be memorized, but a few are vital. This section asks for those major parameters that you must be able to immediately call to mind while operating and maintaining the equipment.

.6 SYSTEM INTERRELATIONS

Up to this point your thinking has been directed to the system and its internal operations. Now your thinking will be expanded to include how this system fits into the total picture: (how this system **is affected** by the operation of other systems, and how other systems are affected by the operation of this system).

.7 SAFETY PRECAUTIONS

Here you will be called upon to discuss any special safety precautions unique to this system. These unique safety precautions apply to personnel and/or equipment.

300 Series - WATCHSTATIONS

This series includes the procedures you must know in order to properly operate and maintain the equipment. Do not let your thinking become limited to the concept that you stand watch only if your name is on a watch bill. In the Qualification Standard usage, you are considered to be at your watchstation anytime you face the equipment and use your intelligence to cause it to perform correctly or try to analyze malfunctions. While all possible procedures may not be detailed in this section, the procedures that you can reasonably be expected to complete are covered by an OPERATOR and TECHNICIAN watchstation. Each is explained in detail as follows:

## (OPERATOR WATCHSTATION)

### .1 OPERATING INSTRUCTIONS

As a result of your study of the 200 Series of the Qualification Standard, you know what the systems do, how they do it, and many other aspects of their operation. You have spent a lot of time acquiring the necessary knowledge, all of which is of little value to you and the Navy unless you are able to use it to perform in an efficient manner. In this section you will be directed to perform and discuss various aspects of procedures, demonstrating your ability to cope with the equipment(s) at your watchstation.

### .2 NORMAL OPERATIONS

Here you will be directed to describe those conditions that exist that indicate the system is functioning properly.

### .3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

An abnormal condition is the first stage of a sequence of events that will lead to an emergency and/or casualty. You must be able to recognize the symptoms of these abnormal conditions and you must also know what immediate corrective action to take. In this section you will discuss the more pertinent of the abnormal conditions.

### .4 EMERGENCIES and/or CASUALTIES

In this section you will discuss and/or perform when practicable the procedures for limiting the damage from the emergencies and casualties most pertinent to the watchstation.

### .5 INFREQUENT and/or ABNORMAL OPERATIONS

This area is devoted to the discussion and/or performance when practicable of those procedures that are considered too dangerous, too time consuming, or that occur too infrequently to be made mandatory performance items.

## (TECHNICIAN WATCHSTATION)

### .1 MAINTENANCE INSTRUCTIONS

In studying to be a technician, your operating knowledge will be expanded to include the maintenance of the equipments you have operated. In this section you will be directed to discuss and perform the routine maintenance checks, tests, alignments, repair, replacements, etc., that keep the equipment and machinery assigned to you in a "combat ready" condition.

### .2 INFREQUENT and/or ABNORMAL MAINTENANCE OPERATIONS

As is true of the operator watchstation, there are infrequent and/or abnormal maintenance operations that are too time consuming to make them mandatory performance items. In this section you will be asked to discuss and perform those procedures when practicable.

## 400 Series - QUALIFICATION CARDS

The qualification standard has been written so that upon completion of all sections you will be able to both operate and maintain the equipments at your watchstation(s). In practice however, where you start in the standard will in part be determined by the needs of the command. Therefore depending upon the immediate need for your services, you will be given a qualification card that will tell you which section you must complete first.

The qualification cards reference the items you must complete in the 100, 200 and 300 Series of the standard. The cards are your guide, reference, and record of achievement. The qualification cards are packaged separately from the standard and should be carried by you at all times to permit you to take advantage of every opportunity to complete the required items.

You have been given the complete Qualification Standard in the belief that the truly conscientious sailor will make the extra effort to become fully qualified in all respects at the earliest opportunity.

That is the story of the QUALIFICATION STANDARD.

## GLOSSARY OF QUALIFICATION STANDARD TERMS

BLOCK DIAGRAM	A drawing of a system using blocks and lines to show the relationship of components.
CASUALTY	An event or series of events in progress during which equipment damage and/or personnel injury has already occurred. The nature and speed of these events are such that proper and correct procedural steps will only serve to limit damage and/or personnel injury.
CLASSIFICATION AND/OR TYPE	To give the type of classification of various equipment, i.e., a. Check valves- swing, stop and etc. b. Valves - solenoid, manual and etc.
COMPONENT	The major units which when suitably connected comprise a system.
COMPONENT PARTS	The integral parts of a component.
CONTROL POWER	Power used to control or operate a component or component part.
CONTROL SIGNAL	A signal used to activate control circuitry or indication, for example, The signal from a pressure switch.
EMERGENCY	An event or series of events in progress which will cause damage to equipment unless immediate, timely and correct procedural steps are taken.
FAIL	1. The loss of control signal or power to component. 2. The breakage or breakdown of a component or component part.
FAIL POSITION	The operating or physical position which a device will go upon loss of

FUNCTION	To perform the normal or characteristic action of anything, or special duty or performance required of a person or thing in the course of work.
INTERLOCK	A feature or device in one system or component that effects the operation of another system or component. Generally a safety device but may be used to control the operating sequence of components.
MONITORING POINT	The physical location at which any indicating device displays the value of a parameter at some control station.
ONE LINE SCHEMATIC DIAGRAHM	A drawing of a system using only one line to show the tie-in of various components, i.e., the three conductors needed to transmit 3 phase power are represented by a single line.
SIMPLE SKETCH	A simplified pictorial illustration of a system.
OPERATING CHARACTERISTICS	The combination of a parameter and its setpoint.
PARAMETERS	A variable such as temperature, pressure, flow rate, voltage, current, frequency, etc., which may be indicated, monitored, checked or sensed in any way during operation or testing.
PROTECTIVE FEATURE	A feature of a component or component part designed to protect a component or system from damage.

SENSING POINT	The physical and/or functional point in a system at which a signal may be detected, monitored or may cause some automatic operation to result.
SETPOINT	<p>The numerical value of a parameter at which:</p> <ol style="list-style-type: none"> <li>An alarm is actuated.</li> <li>Operator action is required.</li> <li>Proper operation ceases and damage may occur.</li> </ol>
SPECIAL FUNCTION	A unique service performed by the system under discussion usually above and beyond the direct design intent of the system. These special functions have usually been provided by making small modifications to a simple system vice constructing a discrete system to perform a single evolution.
STANDARD PRINT	A standard drawing, schematic, or blueprint produced in the applicable technical manual, or other official technical publication.
SYSTEM	The major functional section of an installation selected for individual attention.
SYSTEM INTERRELATION	Specific individual operations in one system effecting the operation in another system under normal conditions which are not fully described in emergency or casualty procedures or in the functional discussion of the system.
WATCHSTATION	Duties, assignments or responsibilities which an individual or group of individuals may be called upon to carry out. Not necessarily a normally manned position with a "watchbill" assignment.

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ELECTRICAL THEORY - GENERAL

This section identifies the terms, principles and laws that will give you a foundation of understanding of Electrical Theory - General upon which a working knowledge can be built. The references used for this section are:

a. Basic Electricity NAVPERS 10086.

101.1 ELECTRON THEORY AND CURRENT FLOW

- .11 Define matter.
- .12 Describe the composition of matter in terms of atomic structure.
- .13 Describe and compare the atomic structure of conductors, semi-conductors, and insulators in terms of free electrons and energy levels.
- .14 Describe and compare current flow and random electron movement in a conductor.

101.2 VOLTAGE

- .21 Define voltage.
- .22 Explain the various methods of producing a voltage in terms of electron displacement.
- .23 Discuss several applications of each method of producing a voltage.

101.3 BASIC CIRCUIT ANALYSIS

- .31 Define each of the following terms and discuss factors influencing them:
  - a. Resistance
  - b. Impedance
  - c. Inductance
  - d. Inductive reactance
  - e. Capacitance
  - f. Capacitive reactance
  - g. Phase angle
  - h. Power
- .32 Discuss OHM'S LAW problems using the terms voltage, current, impedance, power, phase angle, and time constant.
- .33 Explain the importance of KIRCHOFF'S LAWS in circuit analysis.
- .34 Explain the relationships between peak, average and effective values of voltage, and of current.

101.4 MAGNETIC CIRCUITS

- .41 Define the following terms:
  - a. Maxwell
  - b. Gilbert
  - c. Rel
  - d. Permeability
  - e. Hysteresis
  - f. Flux Density
  - g. Magneto Motive Force
  - h. Coercive Force
  - i. Magnetic Domains
  - j. Magnetic Induction
- .42 Explain the use of the left-hand rules for coils and for conductors.
- .43 Describe how the characteristics of a given magnet material can be determined by the analysis of its hysteresis loop.
- .44 Discuss the various uses of electromagnets in relays, controllers and signaling devices.
- .45 Discuss various methods of connecting transformers.
- .46 Explain the theory of E-coil transformers.
- .47 Describe the operation of two phase torquers.
- .48 Describe the operation of the electrolytic level.

101.5 AC GENERATION

- .51 Indicate an understanding of Basic AC Generation by explaining:
  - a. The reasons for generating nearly all electrical energy as AC.
  - b. Cycle.
  - c. Generation of a sine-wave voltage, produced throughout the cycle in terms of:
    - 1. Maximum value
    - 2. Instantaneous value
    - 3. Average value
    - 4. Effective value (RMS)

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ELECTRONIC THEORY

This section identifies the terms, principles and laws that will give you a foundation of understanding of Electronic Theory, upon which a working knowledge can be built. The references used for this section are:

- a. Basic Electricity, NAVPERS 10086
- b. Basic Electronics, NAVPERS 10087
- c. U. S.N. SYNCHROS, OP1303

102.1

CIRCUIT ANALYSIS

- .11 Explain the purpose, operation and application of the following electronic circuits:
  - a. Voltage regulator
  - b. Impedance bridge
  - c. AC and DC amplifiers
  - d. Emitter follower
  - e. Current limiter
  - f. DC power supply
  - g. Potentiometers
  - h. Zener diodes
  - i. Servo loops
  - j. Multivibrators
  - k. Transistors
  - l. Step by step transmitter
  - m. Synchro transmitter
- .12 Describe how the output (error) voltage is developed in the E-coil transformer.
- .13 Explain the effects of forward and reverse bias on diode operation.
- .14 Demonstrate schematic diagram reading ability in the general types of circuit configurations by:
  - a. Locating the input signal
  - b. Tracing the signal through to the output
  - c. Locating bias(s) and/or feedback(s)
  - d. Identifying the general type of circuit configuration from among the categories listed below:

The common circuit configurations are:

  1. Transistorized circuitry
  2. One and thirty-six speed synchro circuits
  3. Modulator/Demodulator circuits
  4. Light operated step transmitter circuits

102.1 CIRCUIT ANALYSIS CONT'D

- .16 Describe the following Electro-Mechanical circuits in terms of purpose, operation and application:
- a. Synchro operation.
  - b. Bi-directional servo operation.

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GYROSCOPIC THEORY

This section identifies the terms, principles, and laws that will give you a foundation of understanding of GYROSCOPIC THEORY, upon which a working knowledge can be built. The references used for this section are:

- a. NAVPERS 10546, Electrician's Mate 3 and 2.
- b. NAVPERS 10558, I C Electrician 3 and 2.
- c. NAVSHIPS 0924-007-5010, section four.

103.1

GYROSCOPIC PRINCIPLES

- .11 Describe the characteristics of the gyroscope.
- .12 Discuss the effects on the gyroscope caused by:
  - a. Gyroscope inertia
  - b. Precession
  - c. Earth's rotation
  - d. Gravity
- .13 Discuss how apparent rotation varies with:
  - a. Equator
  - b. Latitude
  - c. Hemisphere
- .14 Explain earth rates:
  - a. Vertical earth rate
  - b. Horizontal earth rate
- .15 Explain how the free gyroscope is converted into a gyrocompass in terms of:
  - a. How the gyro is made to seek north
  - b. How the north seeking gyro is caused to settle on the meridian to become a north indicating gyro



104 SEMI-CONDUCTOR THEORY

This section identifies the terms, principles, laws, and applications of semi-conductors in the field of electronics. The material contained herein will provide a background knowledge required for SEMI-CONDUCTOR THEORY. The references to be used are as follows:

- a. Basic Electronics, NAVPERS 10087.
- b. Fundamentals of Electronics, NAVPERS 92400.

104.1 SEMI-CONDUCTOR DEVICES

- .11 Demonstrate an understanding of semi-conductors by:
  - a. Describing how the crystal lattice is formed in terms of covalent bonding.
  - b. Explaining why silicon and germanium (as intrinsic) crystals are not good conductors.
  - c. Describing the effect of thermal agitation on electrons in the covalent bond.
  - d. Stating the purpose of "doping" a semi-conductor.
  - e. Describing the majority and minority carriers, and impurities that may be used in the following types of semi-conductors:
    1. "N type"
    2. "P type"
  - f. Describing the depletion region of the PN junction in terms of potential charge and absence of current carriers.
  - g. Describing forward and reverse bias and its effect on the majority current carriers.
- .12 Explain the use of bias in semi-conductors in terms of:
  - a. Its effect on the barrier potential.
  - b. Why proper bias is necessary for transistor operation.
  - c. Comparing the current flow of the zener diode with forward bias and with reverse bias.
  - d. The effect of avalanche or breakdown voltage on the crystal lattice structure of the diode.
- .13 Draw a schematic diagram of the following semi-conductors with the proper bias applied:
  - a. PN diode
  - b. Zener diode
  - c. Transistor
  - d. Silicon control rectifier
  - e. Unijunction transistor

104.1 SEMI-CONDUCTOR DEVICES CONT'D

- .15 Explain the use of a zener diode in shunt regulator circuits by:
  - a. Describing the need for a voltage regulating circuit.
  - b. Drawing a schematic diagram of a simple shunt voltage regulator.
  - c. Describing the affect a zener diode has on load voltage during changes in source voltage.
  - d. Describing the action of a double anode zener voltage regulator circuit and show current flow during operation.
- .16 Draw a schematic diagram of the following type circuit configurations using NPN and/or PNP transistors and single battery bias:
  - a. Common emitter
  - b. Common base
  - c. Common collector
  - d. Single ended power
  - e. Complimentary symmetry(push-pull)
- .17 Describe the phase relationship, voltage and current amplitude of the output signal in respect to the input signal of the following configurations:
  - a. Common emitter
  - b. Common base
  - c. Common collector
  - d. Sinle ended power
  - e. Complimentary symmetry(push-pull)
- .18 List the following typical characteristics for each of the three basic transistor configurations:
  - a. Input impedance
  - b. Output impedance
  - c. Voltage gain
  - d. Current gain
  - e. Power gain
- .19 Explain the action of the following thermal stabilizers during changes of temperature on the Base-emitter bias voltage:
  - a. Resistor stabilizer
  - b. Transmitter stabilizer
  - c. Diode stabilizer
  - d. Zener diode stabilizer

104.1 SEMI-CONDUCTORS CONT'D

- .111 Define the following terms as they apply to transistor circuits.
  - a. Beta
  - b. Alpha
  - c.  $I_{CO}$
  - d.  $I_{EO}$
- .112 Describe inter-element capacitance and how to compensate for its effects.
- .113 Describe frequency response, its limitations, and how to compensate for frequency limitations.

105.3 ELECTRICAL FIRES

- .31 Explain the procedures which are to be followed when combatting an electrical fire.
- .32 State the agents to be used and explain their proper use when fighting electrical fires.

105.4 CLEANING AGENTS

- .41 Explain the desirable characteristics of a good cleaning agent for electrical equipment.
- .42 Explain which are the desirable cleaning agents for electrical equipment.
- .43 Describe the hazards which can be encountered with cleaning agents due to environmental conditions.

## 06 TROUBLESHOOTING

This section identifies the terms, principles, and laws that will give you a foundation of understanding of a logical approach to troubleshooting. The references used for this section are:

- a. Basic Electricity, NavPers 10086.
- b. Electrician's Mate 3&2, NavPers 10546.

### 06.1 SIX STEP PROCEDURE

- .11 Discuss the below listed steps of troubleshooting:
  - a. Recognition of a normal condition
  - b. Recognize that a malfunction has occurred, is occurring or is about to occur.
  - c. Collect all the available data about the malfunction
  - d. Listing of probable faulty function(s)
  - e. Sectionalize the faulty function(s)
  - f. Localize the malfunction(s) to the troubled system/component/component part
- .12 Describe how the six step procedure is used to locate a trouble in an electrical/electronic circuit.
- .13 Describe how the six step procedure is used to locate a trouble in a mechanical device.

### 06.2 USE OF SENSES

- .21 Describe how the senses may be utilized to locate a faulty system/component/component part.



201 MK-27 MOD-0 GYROCOMPASS SYSTEM

201.1 Explain the function or the functions of the MK-27 MOD-0 GYROCOMPASS SYSTEM as stated in NAVSHIPS 0924-007-5010.

.11 Refer to a standard print of this system during the rest of this discussion.

201.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the protective devices for this component.
- G. Discuss the protection provided by this component.
- H. Describe the physical location of the sensing points for the component.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>
.21	Binnacle	X	X	X				X	
.22	Compass element system (Detailed System 205)	X	X	X	X				
.23	Follow-up system (Detailed System 208)	X	X			X	X		
.24	Power converter system (Detailed System 203)	X	X	X	X		X		
.25	Power supply system (Detailed System 204)	X	X		X		X		
.26	Caging system (Detailed System 207)	X	X						X
.27	Transmission system (Detailed System 209)	X	X			X	X		X
.28	Latitude correction system (Detailed System 210)	X	X			X			X
.29	Start/Run system (Detailed System 206)	X	X		X		X		X

201.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

201.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- A. How and where signal is originated.  
 B. How and where signal is utilized.  
 C. How and where signal is amplified.  
 D. How and where signal is detected.  
 E. How and where signal is indicated.  
 F. How and where signal is converted.  
 G. How and where the control function is accomplished.  
 H. How the alarm function(s) is accomplished.

		A	B	C	D	E	F	G	H
.41	Pickoff signal	X	X	X	X				X
.42	Latitude correction signal	X	X						X
.43	Alarm signal	X	X		X				X
.44	Level signal	X	X	X	X	X	X	X	X

201.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

201.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:  
 1. Failure of Ships Service Distribution System  
 B. There are no effects on other systems due to the operation of this system.

201.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

## 202 MK-27 MOD-0 GYRO FRONT PANEL CONTROL SYSTEM

- 202.1 Explain the function or the functions of the MK-27 MOD-0 GYRO FRONT PANEL CONTROL SYSTEM as stated in NAVSHIPS 0924-007-5010.
- .11 Draw a one line sketch of this system from memory using appropriate symbols and showing all components listed in 202.2.
- .12 Refer to a standard print of this system during the rest of this discussion.

## 202.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. Discuss the protection provided by this component.
- G. List the positions and function(s) of each of the designated switches.
- H. List the interlocks associated with the designated components.
- I. List the major loads supplied.

		A	B	C	D	E	F	G	H	I
.21	Fuse holders (3)	X	X	X	X		X			
.22	Power Indicator light DS-1	X	X	X	X					
.23	Followup Alarm Indicator light DS-2									
.24	Caged Indicator light	X	X	X	X		X		X	
.25	Dimmer Control (R-27)	X	X	X	X					X
.26	Mode Selector switch	X	X	X	X			X		
.27	Level Meter	X	X	X		X				
.28	North-South (NS) switch	X	X	X				X		
.29	Repeater switch	X	X	X	X			X		
.210	Tilt/Azimuth Control switch	X	X	X				X		
.211	Latitude Control (R-28)	X	X	X	X	X				

### 202.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

### 202.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- A. How each position of the designated switches effects the system.  
B. How the protective function(s) is accomplished.  
C. How the alarm function(s) is accomplished.  
D. How the interlocking is accomplished.

	A	B	C	D
.41 Fuse holders(3)		X		
.42 Followup Alarm Indicator light			X	
.43 Mode Selector switch	X			
.44 North-South switch	X			
.45 Repeater switch	X			
.46 Tilt/Azimuth Control switch	X			
.47 Cager Control switch	X			X

### 202.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

### 202.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
1. Loss or Excessive Power from the Power Supply System.
  2. Uncaging of the Cager System.
  3. Excessive Error signal in the Follow-up System.
- B. Describe the effects on the following systems due to the operation of this system.
1. MK--27 MOD-0 Gyro System.

### 202.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions unique to this system.
1. Caging and Uncaging Gyro.
  2. Changing position of N-S SWITCH.

203 POWER CONVERTER SYSTEM

- 203.1 Explain the function or the functions of the POWER CONVERTER SYSTEM as stated in NAVSHIPS 0924-007-5010.
- .11 Refer to a standard print of this system during the rest of this discussion.

203.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
.21	Power transformer	X	X	X	X
.22	Diodes	X	X	X	X
.23	Reactor	X	X	X	X
.24	Filter capacitor	X	X	X	X
.25	Bleeder resistor	X	X	X	X
.26	Line filters	X	X	X	X
.27	Terminal strip	X	X	X	X

203.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

203.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 How the ship's supply voltage is stepped down.
- .42 How the stepped down voltage is rectified.
- .43 How the rectified voltage is filtered.

203.5 MAJOR PARAMETERS

- A. There are no major parameters in this system

203.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of Ship's Service Distribution System.
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Power Supply System.

203.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

# 04 POWER SUPPLY SYSTEM

04.1 Explain the function or the functions of the POWER SUPPLY SYSTEM as stated in NAVSHIPS 0924-077-5010.

.11 Refer to a standard print of this system during the rest of this discussion.

## 04.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the protective devices for this component.
- G. Discuss the protection provided by this component.
- H. List the positions and function(s) of each of the designated switches.
- I. Describe the "fail" position of the component on loss of power and the reason(s) it fails in this position.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>I</u>
.21	Series regulator	X	X	X	X		X			
.22	Shunt regulators	X	X	X	X		X			
.23	Pulse generator	X	X	X	X	X				
.24	Multi vibrator	X	X	X	X	X				
.25	Phase inverter	X	X	X	X	X				
.26	Transformer T1	X	X	X	X					
.27	Power output amplifier	X	X	X	X	X				
.28	Power transformer T2	X	X	X	X					
.29	Transformer T3	X	X	X	X					
.210	Bridge rectifiers	X	X	X	X					
.211	Filter C11-C12	X	X	X	X					
.212	Power on relay K3	X	X	X	X					X
.213	Switch S1 Deck 1	X	X	X						X
.214	Fuses F1	X	X	X	X			X		

204.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 How pulse frequency is determined and generated.
- .42 How the trigger pulse is used to switch the multivibrator.
- .43 How the multivibrator output is phase inverted.
- .44 How the signal is amplified.
- .45 How the 20VDC is obtained.
- .46 How the 17VDC is obtained.
- .47 How the power on relay is actuated.

204.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

204.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of the Power Converter System.
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Start/Run System
  - 2. Caging System
  - 3. Follow-up System
  - 4. Transmission System
  - 5. Latitude Correction System
  - 6. Alarm System

204.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

## 5 COMPASS ELEMENT STRUCTURAL SYSTEM

- 5.1 Explain the function or the functions of the COMPASS ELEMENT STRUCTURAL SYSTEM as stated in NAVSHIPS 0924-007-5010.
- .11 Draw a real simple sketch of this system from memory using appropriate symbols and showing all components listed in 205.2.
- .12 Refer to a standard print of this system during the rest of this discussion.

## 5.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
.21	Gyro sphere	X	X	X	
.22	Gyro motor	X	X	X	X
.23	Liquid ballistic	X	X	X	
.24	Vertical ring	X	X	X	
.25	Phantom yoke	X	X	X	

## 5.3 COMPONENT PARTS

Discuss the designated items for each component part listed below:

- A. Explain the function or the functions of the component part in terms of what it does for the component.
- B. Describe the functional location of this component part within the component.
- C. Explain how the component part carries out it's function.
- D. Describe the major materials used and explain why.

205.3 COMPONENT PARTS CONT'D

		A	B	C	D
.31	Gyro sphere				
	a. Frame	X	X	X	
	b. Hemispheric shell	X	X	X	
	c. Helium gas	X			
.32	Gyro motor				
	a. Stator	X	X	X	
	b. Bearings	X	X	X	
	c. Flywheel	X	X	X	X
	d. Endbells	X	X	X	
	e. Retainer rings	X	X	X	
	f. Clamps	X	X	X	
	g. Electrical leads	X	X	X	
	h. Oil wicks	X	X	X	
.33	Liquid ballistic				
	a. Tanks	X	X	X	X
	b. Tubes	X	X	X	X
	c. Fluid	X	X	X	X
.34	Vertical ring				
	a. Vertical axis bearings	X	X	X	
	b. Horizontal pivots	X	X	X	
	c. Horizontal contacts	X	X	X	
	d. Spring stop	X	X	X	
	e. Balancing weights	X	X	X	
	f. Azimuth pickoff	X	X		
	g. Cager stops	X	X	X	
	h. Bumper stops	X	X	X	
	i. Electrolytic level	X	X		
	j. Stop post	X	X	X	
	k. Pillow blocks	X	X	X	
.35	Phantom yoke				
	a. Support plate	X	X	X	
	b. Slip rings & hairsprings	X	X	X	
	c. Cager button	X	X	X	
	d. Card gear	X	X	X	
	e. Azimuth gear	X	X	X	
	f. Spring stop	X	X	X	
	g. Interlock switch	X	X	X	
	h. Cager slide	X	X	X	
	i. Leaf spring	X	X	X	
	j. Cager switch	X	X	X	
	k. Cager level	X	X	X	
	l. Phantom yoke	X	X	X	

PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- 1 How the three degrees of freedom are obtained.
- 2 How the compass element is made North indicating.
- 3 How the compass element is made North seeking.
- 4 The following special functions of this system:
  1. Bouyancy gyro sphere.
- 5 The sensing and monitoring points for the following:
  1. Own ships course.

MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  1. Follow-up System failure
  2. Power Supply System failure
  3. Improper setting of Latitude Correction System
  4. Loss of compass rotor voltage supply from Start/Run System
- B. Describe the effects on the following systems due to the operation of this system.
  1. Follow-up System

SAFETY PRECAUTIONS

- A. Discuss the safety precautions unique to this system.
  1. Caging system operated during run mode.

06 GYRO START/RUN SYSTEM

- 06.1 Explain the function or the functions of the GYRO START/RUN SYSTEM as stated in NAVSHIPS 0924-007-5010.
- .11 Refer to a standard print of this system during the rest of this discussion.

06.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List the positions and function(s) of each of the designated switches.

	A	B	C	D	E
.21 Transformers	X	X	X	X	
.22 Mode selector switch	X	X	X	X	X
.23 Gyro motor	X	X	X	X	
.24 Rectifier	X	X		X	
.25 Filter	X	X		X	
.26 Start relay	X	X	X	X	
.27 Capacitor C2	X	X			
.28 Zener diode	X	X			X
.29 Resistor R3	X	X			
.210 Capacitor C3	X	X			
.211 Capacitor C4	X	X			
.212 Cager control switch	X	X	X	X	X
.213 Caged light	X	X	X	X	
.214 Capacitor C8	X	X		X	
.215 Servo motor	X	X	X	X	
.216 Interlock switches	X	X	X	X	X

06.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

206.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 How the start relay is energized.
- .42 How the start relay is de-energized.
- .43 How interlocking is accomplished.
- .44 How the series capacitance to the gyro motor is decreased.

206.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

206.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of the Power Supply System
  - 2. Operation of the Caging System
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Compass Element Structural System
  - 2. Leveling system
  - 3. Power Supply System

206.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

207 GYRO CAGING SYSTEM

- 207.1 Explain the function or the functions of the GYRO CAGING SYSTEM as stated in NAVSHIPS 0924-007-5010.
- .11 Draw a one line block diagram of this system from memory using appropriate symbols and showing all components listed in 207.2
- .12 Refer to a standard print of this system during the rest of this discussion.

207.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the protective devices for this component.
- G. Discuss the protection provided by this component.

		A	B	C	D	E	F	G
.21	Cager button	X	X	X	X			
.22	Caging lever	X	X	X				X
.23	Leaf spring	X	X	X				
.24	Pivot	X	X	X				
.25	Cager slide	X	X	X				
.26	Interlock micro-switches	X	X	X	X	X	X	
.27	Cager stops	X	X	X				X
.28	Caged light	X	X	X	X			X

207.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

207.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 How the interlock micro-switches are operated by the cager switch.
- .42 The pickoff signal flow path when the gyro is caged and uncaged.
- .43 How electrical interlock is accomplished.

207.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

207.6 SYSTEM INTERRELATIONS

- A. There are no effects on this system due to the operation of other systems.
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Leveling System
  - 2. Follow-up System
  - 3. Power Supply System

207.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

# 208 GYRO FOLLOW-UP SYSTEM

208.1 Explain the function or the functions of the GYRO FOLLOW-UP SYSTEM as stated in NAVSHIPS 0924-007-5010.

.11 Draw a one line block diagram of this system from memory using appropriate symbols and showing all components listed in 208.2.

.12 Refer to a standard print of this system during the rest of this discussion,

## 208.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the protective devices for this component.
- G. Discuss the protection provided by this component.
- H. List the positions and function(s) of each of the designated switches.
- I. List the interlocks associated with the designated components.
- J. Describe the physical location of the sensing points for the component.

	A	B	C	D	E	F	G	H	I	J
.21 Mode selection switch	X	X	X					X		
.22 Servo amplifier module	X	X	X	X	X	X	X			
.23 Azimuth motor	X	X	X	X	X	X			X	
.24 Azimuth gear	X	X	X							
.25 Phantom yoke	X	X	X							
.26 E Core pickoff	X	X	X	X					X	X
.27 Tilt/Azimuth switch	X	X	X					X		
.28 Electrolytic level	X	X	X	X						X
.29 Caged lamp	X	X	X	X					X	
.210 Tilt meter	X	X	X		X					
.211 Tilt circuit (Demodulator)	X	X	X	X	X					

208.3 COMPONENT PARTS

Discuss the designated items for each component part listed below:

- A. Explain the function or the functions of the component part in terms of what it does for the component.
- B. Describe the physical location of this component part within the circuit.
- C. Explain how the component part carries out its function.
- D. List or describe the sources of power to this component part.

A B C D

.31 Azimuth motor

a. Control windings

X X X X

b. Reference windings

X X X X

208.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

.41 How the pickoff signal is utilized.

.42 How the level signal is utilized.

.43 How the slew signal is utilized.

208.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

208.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  1. Failure of Power Supply System
  2. Uncaging of Cager System
  3. Increasing signal from Latitude Correction System
- B. Describe the effects on the following systems due to the operation of this system:
  1. Transmission System
  2. Compass Element Structural System
  3. Power Supply System

208.7 SAFETY PRECAUTIONS

209 TRANSMISSION SYSTEM

209.1 Explain the function or the functions of the TRANSMISSION SYSTEM as stated in NAVSHIPS 0924 -007-5010.

.11 Draw a one line block diagram of this system from memory using appropriate symbols and showing all components listed in 209.2.

.12 Refer to a standard print of this system during the rest of this discussion.

209.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the protective devices for this component.
- G. Discuss the protection provided by this component.
- H. List the positions and function(s) of each of the designated switches.

		A	B	C	D	E	F	G	H
.21	Mode selector switch	X	X	X	X				X
.22	Repeater switch	X	X	X	X				X
.23	Synchro transmitter 1X	X	X	X	X		X		
.24	Synchro transmitter 36X	X	X	X	X		X		
.25	Step transmitter	X	X	X	X				
.26	Start relay	X	X	X	X			X	
.27	Switching network	X	X	X	X	X	X		
.28	Azimuth motor	X	X	X					

209.3 COMPONENT PARTS

Discuss the designated items for each component part listed below:

209.3 COMPONENT PARTS CONT'D

- C. Describe the physical location of this component part within the component.
- D. Describe the physical location of this component part within the circuit.
- E. Explain how the component part carries out it's function.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
.31	Step transmitter					
	a. Pick-off excitation lamps	X	X	X	X	X
	b. Shutter and aperture	X	X	X		X
	c. Light sensitive transistors	X	X	X	X	X

209.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 The position of the following components on each of the cardinal headings:
  - a. Synchro transmitter 1X
  - b. Synchro transmitter 36X
  - c. Step transmitter
  - d. Azimuth motor

209.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

209.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of the Follow-up System
  - 2. Failure of Power Supply System
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Follow-up System
  - 2. Power Supply System

209.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

## 210 LATITUDE CORRECTION SYSTEM

210.1 Explain the function or the functions of the LATITUDE CORRECTION SYSTEM as stated in NAVSHIPS 0924-007-5010.

.11 Refer to a standard print of this system during the rest of this discussion.

## 210.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. List the positions and function(s) of each of the designated switches.

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
.21 Latitude control potentiometer R-28	X	X	X	X	X	
.22 North - South switch	X	X	X			X
.23 E Core transformer	X	X	X			X
.24 Limiting register R29 & R30	X	X	X			
.25 E Core transformer armature	X	X	X			

## 210.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

## 210.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

- .41 How the manual latitude control adjusts the latitude correction voltage.
- .42 How the latitude N-S switch changes the polarity of the latitude correction voltage.
- .43 How the latitude correction voltage is changed to torque and applied to the compass element system.
- .44 How the applied torque corrects for the latitude

210.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

210.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of Power Supply System
- B. Describe the effects on the following systems due to the operation of this system.
  - 1. Compass Element Structural System
  - 2. Power Supply System

210.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

211 ALARM SYSTEM

211.1 Explain the function or the functions of the ALARM SYSTEM as stated in NAVSHIPS 0924-007-5010.

.11 Refer to a standard print of this system during the rest of this discussion.

211.2 SYSTEM COMPONENTS - GENERAL

Discuss the designated items for each component listed below:

- A. Explain the function or the functions of the component in terms of what it does for the system.
- B. Describe the functional location of the component with respect to it's position in the system and the reason(s) for it's location in this position.
- C. Show or describe the actual physical location of this component.
- D. Describe the sources of power.
- E. List or describe the sources of control signals.
- F. Describe the "fail" position of the component on loss of power and the reason(s) it fails in this position.

		A	B	C	D	E	F
.21	Follow-up fail relay K2	X	X	X	X		X
.22	Power alarm relay K4	X	X	X	X		X
.23	Current limiting resistor R 35	X	X	X			
.24	Current increasing resistor R 4	X	X	X			
.25	Switching transistor Q 1	X	X	X	X	X	
.26	Signal rectifier CR 4	X	X	X			
.27	Signal filter C 6	X	X	X			
.28	Sensitivity resistors R5 & R34	X	X	X			
.29	Alarm indicator lamp DS 2	X	X	X	X		

211.3 COMPONENT PARTS

- A. There are no component parts in this system to be discussed.

211.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing:

211.4 PRINCIPLES OF OPERATION CONT'D

- .42 The path(s) of current flow necessary to operate the power alarm relay.
- .43 How de-energizing power alarm relay causes a visual alarm.
- .44 How de-energizing power alarm relay causes an audible alarm.

211.5 MAJOR PARAMETERS

- A. There are no major parameters in this system to be discussed.

211.6 SYSTEM INTERRELATIONS

- A. Describe the effect on this system due to the following:
  - 1. Failure of Follow-up System
  - 2. Failure of Power Supply System
- B. There are no effects on other systems due to the operation of this system.

211.7 SAFETY PRECAUTIONS

- A. There are no safety precautions unique to this system.

301 WATCHSTATION - MK-27. MOD-0 GYRO COMPASS  
OPERATOR

301.1 OPERATING INSTRUCTIONS

For the operating insructions listed below:

- A. Explain the reasons for each step of this procedure.
- B. Discuss the control/coordination required while performing this procedure.
- C. Discuss the communications that must be established and/or utilized.
- D. Discuss the safety precautions that must be observed.
- E. Perform the steps of this procedure.
- F. Perform the steps of this procedure when practicable.

		A	B	C	D	E	F
.11	Normal sea starting	X	X	X	X	X	
.12	Heavy sea starting	X	X	X	X		X
.13	Routine operation	X	X	X	X	X	
.14	Securing the compass	X	X	X	X	X	
.15	Re-starting procedures	X	X	X	X	X	
.16	Daily PMS	X	X	X	X	X	
.17	Weekly PMS	X	X	X	X	X	
.18	Monthly PMS	X	X	X	X	X	

301.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameters monitored.
- B. Explain how the parameters change.
- C. Describe the meter readings.
- D. Describe the indicator lights.

		A	B	C	D
.21	Slewing operation	X	X	X	
.22	Start operation, in port	X	X	X	X
.23	Manual or automatic leveling operation	X	X	X	
.24	Run operation	X	X	X	X
.25	Start operation, at sea	X	X	X	X
.26	Pre lighting off procedures	X	X	X	X

301.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES  
and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received in/on the Electronic Control Assembly.



# 302 WATCHSTATION MK-27, MOD-0, GYRO MAINTENANCE TECHNICIAN

## 302.1 MAINTENANCE INSTRUCTIONS

For the maintenance instructions listed below:

- A. Describe the sequence of steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Describe the assistance required while performing this procedure.
- D. Discuss the parameter indication(s) that must be monitored.
- E. Discuss the safety precautions that must be observed.
- F. Describe the conditions that warrant the use of this maintenance operation.
- G. Perform the steps of this procedure.

		A	B	C	D	E	F	G
.11	Follow up alarm lamp check	X	X					X
.12	Caged lamp check	X	X					X
.13	Latitude control check	X	X	X			X	X
.14	N-S Switch check	X	X			X		X
.15	Level meter indication check	X	X		X			X
.16	Azimuth card reading check	X	X		X			X
.17	Card window check	X	X					X
.18	Fluid level viewed in window check					X		X
.19	Master unit check	X	X					X
.110	Shock mount check	X	X					X
.111	Cleaning	X	X			X		X

## 302.2 INFREQUENT and/or ABNORMAL MAINTENANCE OPERATIONS

For the infrequent and/or abnormal maintenance operations listed below:

- A. Describe the sequence of steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required while performing this procedure.
- D. Discuss the safety precautions that must be observed.
- E. Describe the conditions that warrant the use of this infrequent and/or abnormal operation.

MK-27 MOD-O GYRO COMPASS SYSTEM

QUALIFICATION SUMMARY

27 MOD-O GYRO COMPASS OPERATOR

Recommended \_\_\_\_\_ COMPLETED \_\_\_\_\_  
(Supervisor/Date) (Department Head/Date)

Recommended \_\_\_\_\_  
(Division Officer/Date)

27 MOD-O GYRO MAINTENANCE TECHNICIAN

Recommended \_\_\_\_\_ COMPLETED \_\_\_\_\_  
(Supervisor/Date) (Department Head/Date)

Recommended \_\_\_\_\_  
(Division Officer/Date)

THEORY AND SYSTEMS SUMMARY

SCHOOL FINAL GRADE

GRADE	INSTRUCTOR	DATE

THEORY:

SIGNATURE	DATE	POINTS
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Electrical Theory

		13
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Electronic Theory

		25
--	--	----

Gyroscopic Theory

		13
--	--	----

Semi-Conductor Devices

		35
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Safety Precautions

		10
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Troubleshooting

		10
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SYSTEMS

MK-27 Mod-O Gyro Compass  
System

		16
--	--	----

MK-27 Mod-O Gyro Front Panel  
Control System

		16
--	--	----

Power Converter System

		8
--	--	---

Power Supply System

		20
--	--	----

Compass Element Structural  
System

		15
--	--	----

Gyro Start/Run System

		15
--	--	----

Gyro Caging System

		10
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Gyro Follow-up System

		16
--	--	----

Transmission System

		15
--	--	----

Latitude Correction System

		10
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WATCHSTATION - MK-27 MOD-0 Gyrocompass Operator

Complete the following System Qualifications:

201 and 202

Perform the following practical factors: (in accordance with the requirements set forth in 301.1)

Normal Sea Starting

SIGNATURE	DATE	POINTS
		5
		5
		5

Heavy Sea Starting

		5
		5
		5

Routine Operation

		5
		5
		5

Securing the Compass

		3
		3
		3

Re-starting Procedures

		5
		5
		5

Daily PMS

		6
		6
		6
		6
		6

Weekly PMS

		8
		8
		8

Monthly PMS

		10
		10

401.2 Discuss with a qualified operator the conditions of evolution~~s~~ listed below: (in accordance with the requirements set forth in 301.2)

		SIGNATURE	DATE	POINT
.21	Slewing Operation			2
.22	Start Operation, In Port			3
.23	Manual or Automatic Leveling Operation			4
.24	Run Operation			3
.25	Start Operation, At Sea			4
.26	Pre-lighting Off Procedure			4

401.3 Discuss with a qualified operator the following abnormal conditions that could lead to emergencies or casualties: (in accordance with the requirements set forth in 301.3)

.31	Error Reading on Compass Card			2
.32	Excessive Tilt			2
.33	Excessive Heat on Power Converter			2
.34	Noisy Rotor Bearing			3
.35	Gyro Rotor Slow to Reach Operating Speed			2

401.4 Discuss with a qualified operator the following emergencies and casualties: (in accordance with the requirements set forth in 301.4)

.41	Loss of Ships Power			2
.42	Failure of Azimuth Motor			2
.43	Gyro Motor will not start			3
.44	Compass slews rapidly when uncaged; Tilt meter full scale			3

402

WATCHSTATION - MK-27 MOD-O GYRO COMPASS  
MAINTENANCE TECHNICIAN

Complete the following System Qualifications:

201 through 211

Complete the following Operator Qualifications:

401

402.1 Perform the following practical factors: (In accordance with the requirements set forth in 302.1)

		SIGNATURE	DATE	P
.11	Follow up Alarm lamp check			
.12	Caged lamp check			
.13	Latitude Control check			
.14	N-S Switch check			
.15	Level Meter Indication check			
.16	Azimuth Card reading check			
.17	Card window check			
.18	Fluid level viewed in window check			
.19	Master unit check			

		SIGNATURE	DATE	POINT
402.111	Cleaning			5
				5
402.2	Discuss with or perform under the supervision of a qualified maintenance technician the following infrequent and/or abnormal operations: (In accordance with the requirements set forth in 302.2)			
.21	Fluid draining and refilling			20
.22	Azimuth motor replacement			20
.23	Motor transmitter replacement			20
.24	1-Speed synchro replacement			20
.25	36-Speed synchro replacement			20
.26	Illumination lamp replacement			20
.27	Electronic Control assembly replacement			20
.28	Electronic control chassis replacement			20
.29	Servo amplifier replacement			20
.210	Power supply subchassis replacement			20
.211	Quarterly PMS			10
.212	Semi-annual PMS			15
.213	Annual PMS			20
.214	Periodic/Situation requirements			10

Personnel Qualification Standard  
Information Report and Suggestion Sheet  
PQS DEVGRU AUTOVON 957-5367

DATE \_\_\_\_\_

Address \_\_\_\_\_

AUTOVON # \_\_\_\_\_

Card Affected \_\_\_\_\_

NAVEDTRA # \_\_\_\_\_

Reflected \_\_\_\_\_

Recommendations (Use additional sheets if necessary)

Suggestions for improving this Qual Standard

NT OF THE NAVY

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